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PROVISIONAL WORLD LIST OF COMPUTER PROGRAMMES FOR FISH STOCK ASSESSMENT AND THEIR AVAILABILITY BY COUNTRY AND FISHERIES INSTITUTE

Edited by

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Fishery Resources and Environment Division

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
ROME, April 1982

PREPARATION OF THIS DOCUMENT

The incentive for preparation of this document arose from the requests continually being received by FAO Fisheries Department for FAO Fisheries Technical Paper (101) Computer programmes for fish stock assessment, by N.J. Abramson, printed in 1971. This document, which has long been out of print[1/], appears to have played a key role in standard FORTRAN programme packages in fisheries assessment, even though many later programmes and programme modifications have now rendered it somewhat out-of-date. The present document began on a cooperative effort between FAO and the institutes mentioned herein, to see what programmes are currently available and being used in those institutes with long experience in computer methodologies, which could form the basis for future compilations by FAO or other organizations. Sincere thanks are expressed to all institutes that cooperated in this study, and it is hoped that the document will prove useful not only to these institutes, but also to new institutes in developing countries entering this important field for the first time.

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ABSTRACT

An annotated catalogue of those computer programmes in fish stock assessment which are available to outside users from various fisheries institutes around the world is presented. With some qualifications mentioned in this report, these programmes may be obtained directly from the institutes concerned.

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INTRODUCTION

In 1980 the Fisheries Department, in the course of an in-house review of FAO publications on fisheries science, noted that since 1971, when FAO published a restricted list of computer programmes by Abramson[1/] which is now out of print, to our knowledge, there has been no further comprehensive initiative of this kind by FAO or other international bodies. A number of partial programme compilations have been assembled by various national institutes, often partially based on Abramson's package; however, many other programmes in common use in national computer centres are of limited availability to other institutes or countries despite being widely used in preparing national assessments. It was evident that a first step toward one or more new sets of standard programmes would be to determine first, what useful programmes exist in the 'developed' fisheries institutes of the world and, secondly, what is their availability to computer centres of fisheries institutes elsewhere in the world.

A questionnaire was sent to a selection of those fisheries institutes which had in the past provided input to FAO on scientific computing, together with a standard form requesting details of available programmes, their state of documentation, language and soft- and hard-ware requirements. A partial summary of the responses received by the institute of origin is given in Table 1; the individual responses are presented in annotated form in the following tables, as received in the language of the donor institute, since any correspondence from potential users will proceed directly with them, not through FAO.

Please note that FAO does not have a complete set of the programmes listed here, nor does FAO accept responsibility for the validity, accuracy and proper use of these programmes; the responsibility rests entirely with the user to understand the theoretical basis and constraints underlying such programme. Some aid with this type of problem may be provided at their discretion by the donor institutes. Please remember, however, that most of these are 'working' institutes with specific responsibilities, which do not, for the most part, rest with teaching or the provision of foreign aid.

The responses to this questionnaire essentially form the basis for the following compilation. Further details on any item in the following table should be referred to the donor institute in question, by correspondence to the addresses shown. A point is stressed here that was made by many donor institutes, namely that *a large number of blanket requests for all available programmes irrespective of need, cannot be accommodated.* Please exercise discretion in your requests for assistance from these institutes who have been kind enough to volunteer information. For example, requests for programmes should be accompanied by details of the type of computer available to you and the language of the compiler: *don't* ask for listings that are incompatible with your machine, unless you are able to translate the programme yourself. The donor institutes are not obliged to assist you with this problem.

Evidently, this listing is very limited and, as noted in Caddy (1981)[2/], a number of new initiatives are in progress to prepare new standard sets of programmes in BASIC, FORTRAN and for programmable calculators. Until these are available, however, this catalogue may provide some interim support to new users, as well as encouraging exchange of information between 'developed' institutes. Finally, we repeat our earlier note that FAO, in providing this service, has not the facilities to test the programmes listed here, nor will it be able to assist in resolution of problems stemming from their use, although we would, of course, be happy to receive copies of correspondence from users of these programmes that might be of help in preparing any future update of this compilation.

1/ Abramson, N.J., 1971. Computer programmes for fish stock assessment. FAO Fish.Tech.Pap., (101):148 p.

2/ Caddy, J.F., 1981. New initiatives in preparation of stock assessment programme packages for fisheries. ICES, C.M.1981/D:4, 8 p.

Table 1

A limited selection of fisheries institutions and the documented programme listings they can provide, classified by main type of computation

Originating organization	Language	Model analysis	Fitting growth curve	Gear selectivity	Catch/effort analysis and fishing power	Production modelling	Mortality and survival rate estimation	Tag and recapture	Yield per recruit	Cohort analysis	Survey data analysis	Fitting spawner recruit model	Statistical tests	Sorting routines and data manipulation	Catch projection and simulation	Regression fit and plotting routines	Programmer
Australia																	
CSIRO, Cronulla	FORTRAN		1	1		1		1	1	1					1		Various (many US)
Canada																	
Dept. of Fisheries and Oceans, Ottawa	APL		1				1		2	2					2		Rivard, D. and W.C. Doubleday
Marine Fish Division, Halifax	APL		1			1			1	1					1		Marshall, W.H.
Biological Station, St Andrews	FORTRAN		7							1			1	3			Allen, K.R.
FAO, Rome, Italy	FORTRAN	1	3		1	1	1		3	1		1		1	1	1	Abramson, N.J. (ed.)
	BASIC										5						Coppola, R.S.
France																	
Boulogne sur Mer	HP								2						2		Mesnil, B.
ISTPM, Sète	HPL	1	2		1	2			1	1		1				5	Farrugio, H. and A. Laurec
CNEXO, Brest	HPL and BASIC	1	2			2							6			1	Conan, G.
CNEXO, Brest	FORTRAN								4			2					Laurec, A. and Brannelec
ICLARM, Manila, Philippines	HP		8	1	1	1	4	2	3	3		2				1	Pauly, D.
Kuwait Institute for Scientific Research	BASIC	1	2	2		1	1	1	1	1	1	1	9	7		5	
New Zealand																	
Fisheries Research Division, Wellington	BASIC		1		1			3	1								West, I.F., R. Allen and K.R. Allen
Scotland																	
Dept. of Agriculture and Fisheries, Aberdeen	BASIC									5							Armstrong, D.W.
Spain																	
Instituto Español de Oceanografía, La Coruña	BASIC or HP		1	1										2			Fernandez-Garcia, A.
Instituto Español de Oceanografía, Alculá	BASIC			1					2	2						1	Pereiro, J.A. and P. Pallarés
United States of America																	
NMFS, Woods Hole	FORTRAN		2		2	2	1		5	1	10			1	1	2	esp. Paine K., L. Jackson
NMFS, Miami	FORTRAN					1		1		1	1					1	Fox, W., R.Conser, Parrack
College of Fisheries, University of Washington, Seattle	FORTRAN		1				2		2			2	1	1	1	1	F. Patella and D. Koi Various
US Dept. of Commerce, National Oceanographic Data Center, Wash., D.C.	Various	1	5		1	4	2		6			1	14	4	3	4	Firestone, M.A. (ed.) Programme compilation
USSR																	
VNIRO																	
V. Krasnoselskaya, 17 Moscow 107140			2			1			2	2	1		3			1	
ATLANTNIRO																	

LIST OF PARTICIPATING FISHERIES INSTITUTES

Country	Institute	N° of Programmes	Pages
Australia	CSIRO, Division of Fisheries and Oceanography P.O. Box 21 Cronulla, N.S.W. 2230	7	6
Canada	Department of Fisheries and Oceans Fisheries Research Branch 240 Sparks Street Ottawa, Ontario K1A OE6	13	7-8
	Bedford Institute of Oceanography Marine Fish Division, Resource Branch P.O. Box 1006 Dartmouth, Nova Scotia BEY 4A2	5	9
	Department of Fisheries and Oceans Invertebrates and Marine Plants Division Resource Branch Halifax, Nova Scotia B3J 2S7	3	10
FAO	Fisheries Department Marine Resources and Environment Division Via delle Terme di Caracalla 00100 Rome, Italy	6	11
France	Institut scientifique et technique des pêches maritimes (ISTPM) Centre de la Rochelle	1	12
	ISTPM 1 rue Jean Vilar 34200 Sète	15	13-14
	Centre océanologique de Bretagne (COB) B.P. 337 29273 Brest Cédex	12	15-19
	COB, Centre National pour l'exploitation des océans B.P. 337 29273 Brest Cédex		
Kenya	Ecosystems Limited Box 30239 Nairobi	1	20
Kuwait	Kuwait Institute for Scientific Research P.O. Box 24885 SAFAT Kuwait	33	21-23
New Zealand	Fisheries Research Division Ministry of Agriculture and Fisheries P.O. Box 19062 Wellington	6	24

Country	Institute	N° of programmes	Pages
The Philippines	International Centre for Living Aquatic Resources Management (ICLARM) MCC P.O. Box 1501 Makati, Metro Manila	4	25-26
South Africa	c/o G. Stavrides Department of Sea Fisheries Foretrust Building Foreshore, Cape Town	2	27
Spain	Instituto Español de Oceanografía Alculá 27-40 Madrid 14	7	28
	Instituto Español de oceanografía Laboratorio de la Coruña La Coruña	1	28
UK	Department of Agriculture and Fisheries for Scotland, Marine Laboratory P.O. Box 101 Victoria Road Aberdeen AB9 8DB, Scotland	5	29
USA	National Marine Fisheries Service Northeast Fisheries Center Woods Hole, Massachusetts 02543	27	30-32
	c/o Helen Salo Fisheries Analysis Center College of Fisheries University of Washington Seattle, Washington 98195	10	33
USSR	VNIRO V. Krasnoselskaya, 17 Moscow 107140	12	34-36

KEY TO TABLES

(1) Programme comment statements, in English (E), Spanish (S), French (F), in the body of the text.

(2) Separate description of programme theory/utilization available.

(3) Card deck of programme available.

(4) Test deck available.

AUSTRALIA

LIST OF COMPUTER PROGRAMMES ON STOCK ASSESSMENT AVAILABLE FROM:

CSIRO, Division of Fisheries and Oceanography
P.O. Box 21, Cronulla, N.S.W. 2230

Programme name (or title of publication)	Computer language	Availability of programme documentation	Name and address of programmer/ originating institution	Brief description of programme theory and purpose	Special hardware needed (e.g., tape drive, plotter)	Storage space: # bits, # programme, statements, etc., + other relevant factors
1. VONBER	FORTRAN	1(E),2,3,4	K.R. Allen CSIRO	Fits Von Bertalanffy growth curve from length at age data	Nil	24 K words[1] 450 statements
2. FABENS	"	"	[2]	Fits Von Bertalanffy growth curve from tag recapture data	"	1 K words 160 statements
3. LCANAL	"	"	R. Jones Marine Lab. Aberdeen, UK	Long-term changes in effort and mesh size from length data	"	1 K words 175 statements
4. CHTL	"	"	"	Cohort analysis using length data	"	0.5 K words 65 statements
5. ECMD	"	"	M.A.F.F. Lowestoft, UK	Beverton and Holt Yield per recruit tables	"	1 K words 140 statements
6. PRODFIT	"	"	W. Fox Fish Bull, US	Stock production model equilibrium	"	3 K words 560 statements
7. AFZIS (Australian Fishing Zone Information System)	FORTRAN 4 (CDC Extended)Data base language FORDATA (CODASYL implementation)	1(E),2,3	G. Morris *et al.*, CSIRO Fisheries D.P.I.	Complete system for fisheries data management, including editing, storage retrieval especially for boat parameters, movements, catches by area (soon to be extended to biological data)	Plotting on line printer of grid maps by area	Disk space for large data base, 48 000 60-bit words: approximately 12 000 statements (including comment) - close to real-time information supplied via network across Australia

1/ 60 bit words CDC 7600

2/ Fabens, A.J., 1965. Properties and fittings of the Von Bertalanffy growth curve. Growth 29:265-89

CANADA

LIST OF COMPUTER PROGRAMMES ON STOCK ASSESSMENT AVAILABLE FROM:

Department of Fisheries and Oceans, Fisheries Research Branch
240 Sparks Street, Ottawa, Ontario KIA OE6

Programme name (or title of publication)	Computer language	Availability of programme documentation	Name and address of programmer/ originating institution	Brief description of programme theory and purpose	Special hardware needed (e.g., tape drive, plotter)	Storage space: # bits, # programme, statements, etc., + other relevant factors
1. Virtual population	HP	1(E)[1]	W.G. Doubleday	Cohort or virtual population analysis for completely or incompletely fished cohorts (Pope, 1972[2], Doubleday, 1975[3])	HP - 67 Programmable calculator	
2. Catch prediction	HP	"	"	Uses catch equation of Beverton and Holt, finding F from C by interpolation	"	
3. 'APL programmes for stock assessment'	APL	2(E)[4]	Contact: D. Rivard (address given above)	APL functions for sequential population analysis, yield-per-recruit analysis, catch projections, etc. Also includes sensitivity analysis for certain parameters of interest in management	APL - terminal (with high resolution graphics optional)	37 APL - functions 3 000 statements 130 000 bytes. Uses Statistical Library Functions of IP Sharp Ltd. 145 King W. Toronto, Ontario, Canada M5H 1J8
		1(E)(listings and examples in text)[4]	D. Rivard		"	"
4. COHORT	APL			Sequential population analysis by cohort analysis		
5. VPA	"			Sequential population analysis by Gulland's method		
6. VONB	"			Estimating coefficient of Von Bertalanffy's growth equation		
7. BEVHOLT	"			Yield/recruit computation		

Programme name (or title of publication)	Computer language	Availability of programme documentation	Name and address of programmer/ originating institution	Brief description of programme theory and purpose	Special hardware needed (e.g., tape drive, plotter)	Storage space: # bits, # programme, statements, etc., + other relevant factors
APL Programmes (cont'd)		1(E)(listing and examples in text)4/	D. Rivard		(as above)	(as above)
8. YIELD	APL			Computation of yield from recruits by method of Thompson and Bell		
9. PALOHEIMO	"			Calculation of total mortality		
10. SURVIVOR	"			Estimates survivors in current year from VPA and research survey data		
11. MPROJECT	"			Simulates population changes over several years using the catch equation and partial recruitment. Sensitivity analysis of various output parameters performed		

1/ Doubleday, W.G., 1977. Two stock assessment programmes for a programmable pocket calculator. ICNAF Res.Doc. 77/VI/4.7 Ser. No. 5099 (mimeo)

2/ Pope, J.G., 1972. An investigation of the accuracy of virtual population analysis using cohort analysis. Int.Comm.Northwest Atl.Fish.Res. Bull. 9:65-79

3/ Doubleday, W.G., 1975. A single iterative solution to the catch equation. Northwest Atl.Fish.Res.Doc. 75/42

4/ Rivard, D., APL programmes for stock assessment, 1980 . Canadian Tech. Report of Fisheries and Aquatic Services No. 953, 105 pp.

CANADA

LIST OF COMPUTER PROGRAMMES ON STOCK ASSESSMENT AVAILABLE FROM:
Marine Fish Division, Resource Branch
Bedford Institute of Oceanography
P.O. Box 1006, Dartmouth, Nova Scotia BEY 4A2

Programme name (or title of publication)	Computer language	Availability of programme documentation	Name and address of programmer/ originating institution	Brief description of programme theory and purpose	Special hardware needed (e.g., tape drive, plotter)	Storage space: # bits, # programme, statements, etc., + other relevant factors
1. 5 Interactive Programmes		2(E) c/o Division Chief[1/]	W.H. Marshall			
2. COHORT	APL			Calculates numbers at age and F's by cohort analysis after Pope[2/]		
3. PROJECT	"			Uses Beverton and Holt catch equation to predict ahead Nos/Wt/F and mature biomass.		
4. SCHNUT	"			Fits Schaefer Model using Method of Schnute (1977)[2/]		
5. VONB	"	1(E)[3/]		Fits Von Bertalanffy equation to size at age data		
6. YIELD	"			Uses Thompson and Bell method to calculate yield/ recruit from different F's (Also attempts to calculate F_{MAX}, $F_{0.1}$)	[3/]	

1/ Marshall, W.H., 1978. A programming language (APL), programmes for the assessment of exploited fish stocks. CAFSAC Res.Doc. 78/12 44 p.

2/ Schnute, J., 1977. Improved estimates from the Schaefer production model: theoretical considerations. J.Fish.Res.Board Can., 34(5):583-603

3/ See Ricker, W.E., 1975. Computation and interpretation of biological statistics of fish populations. Bull.Fish.Res.Bd.Can., No.191:382 p.

CANADA

LIST OF COMPUTER PROGRAMMES ON STOCK ASSESSMENT AVAILABLE FROM:

The Division Chief
Invertebrates and Marine Plants Division, Resource Branch
Halifax, Nova Scotia B3J 2S7

Programme name (or title of publication)	Computer language	Availability of programme documentation	Name and address of programmer/ originating institution	Brief description of programme theory and purpose	Special hardware needed (e.g., tape drive, plotter)	Storage space: # bits, # programme, statements, etc., + other relevant factors
1. LOBSTER	FORTRAN IV	1,2(E) 1/	J.F. Caddy	Uses moult increment and frequency data and size at maturity to generate Y/R and population fecundity for different F's		650 statements (comments included)
2. YRAREA	"	1,2(E)2/	"	Simulates effects of contagious recruitment (and directed fishing effort) on age-structured poplin over matrix of unit areas		≈ 1 900 statements (comments included)
3. SQUID Simulation	HP	2(E)3/	"	Models yield from a seasonal available resource (single age class) given rates of immigration/ emigration		2 magnetic cards

1/ *Caddy, J.F., 1979. Notes on a more generalized yield per recruit analysis for crustaceans using size-specific inputs (Fisheries & Marine Service, Canada, MS report No. 1525)

2/ Gales, L.E. and J.F. Caddy, 1975. YRAREA: A programme to demonstrate effects of exploitation on a contagiously distributed shellfish population. FRB Tech.Report No. 582, 79 p.

3/ Caddy, J.F., Preliminary analysis of mortality/immigration and migration of Illex populations on the Scotian shelf

* Present address: Food and Agriculture Organization of the United Nations
Marine Resources Service, Fishery Resources and Environment Division
Via delle Terme di Caracalla, 00100 Rome, Italy

LIST OF COMPUTER PROGRAMMES ON STOCK ASSESSMENT AVAILABLE FROM:

FAO
Fisheries Department, Marine Resources and Environment Division
Via delle Terme di Caracalla
00100 Rome, Italy

Programme name (or title of publication)	Computer language	Availability of programme documentation	Name and address of programmer/ originating institution	Brief description of programme theory and purpose	Special hardware needed (e.g., tape drive, plotter)	Storage space: # bits, # programme, statements, etc., + other relevant factors
1. EISA-80	HPL	(E) Programme description	Coppola, R.S. FAO-FIRM	A package of routines and programmes for: Data Base for input, processing, tabulation, presentation and graphical presentation of the Acoustic Surveys Echo-Integrator Surveys Data	HP9825A Printer Plotter Disk	Not less than 16 kbytes R/W memory
2. SSA-80	"	"	"	Same as above, for the Sonar Surveys Data	"	"
3. ASP 81-EISA	BASIC	(E,F) Programme description	"	"	HP9845B Printer Plotter Disk	56 kbytes R/W memory
4. ASP 81-EISA	"	"	"	"	"	"
5. GC-RC - FIR 22	HPL	(E) Programme description	"	Plotting yield curves from Beverton and Holt for any combination of parameters	HP9825A Plotter Printer (opt.)	16 kbytes R/W memory
6. COHORT ANALYSIS	TI (E,F)	TI Programme record (E)	Doubleday, W.G.	Pope's cohort analysis	Texas Instruments Programmable Calculators	
7. PROJECTION	TI (F)	TI Programme record (F)	"	Projection on/from age-structured population	"	
8. Competing Fleets	HP	2(E)	Caddy, J.F.	Logistic model for production and economic benefits from shared resources by 2 fleets	HP-97	90 statements

FRANCE

LIST OF COMPUTER PROGRAMMES ON STOCK ASSESSMENT AVAILABLE FROM:

Institut scientifique et technique des pêches maritimes
Centre de La Rochelle
France

Programme name (or title of publication)	Computer language	Availability of programme documentation	Name and address of programmer/ originating institution	Brief description of programme theory and purpose	Special hardware needed (e.g., tape drive, plotter)	Storage space: # bits, # programme, statements, etc., + other relevant factors
1. Chaine "ZJONES"	Non-standard BASIC?	1(F)	Cl. de Verdelhan	Analyse de cohorte sur composition en taille des captures: méthode de Jones, R. (Les programmes ont dû être segmentés comme résultat de la capacité de l'unité de la mémoire centrale)	Data Point 1100 (MATRA) Fichiers sur disques à accès direct	3,7 K oct de mémoire

FRANCE

LIST OF COMPUTER PROGRAMMES ON STOCK ASSESSMENT AVAILABLE FROM:

H. Farruggio
I.S.T.P.M.
1, rue Jean Vilar, 34200 Sète

Programme name (or title of publication)	Computer language	Availability of programme documentation	Name and address of programmer/ originating institution	Brief description of programme theory and purpose	Special hardware needed (e.g., tape drive, plotter)	Storage space: # bits, # programme statements, etc., + other relevant factors
1. REG-1	Step by step	French with example	H. Farruggio	Regression lines (all kinds)	HP-97	1 card HP-97 (224 steps)
2. TW-5	"	"	"	Length-weight relation	"	"
3. LIN-1	"	"	"	Linearity test of functions (Schwartz, 1963)	"	"
4. T-TEST	"	"	"	T test for comparison of 2 regression lines (slope and position)	"	"
5. F-TEST	"	"	"	F test for comparison of 2 regressions	"	"
6. GAUSS	"	"	"	Bhattacharhya method	"	"
7. GOMPERTZ	"	"	"	Gompertz growth equation	"	"
8. VB-1	"	"	"	Von Bertalanffy growth equation	"	"
9. DYN-1	"	"	"	Working table A of Gulland for fishing intensity	"	"
10. DYN-2	"	"	"	Z estimate by virtual population method (Fry)	"	"
11. GLOBMOD	HPL	"	"	Computation of global production models: Schaefer and Fox	Plotter (optional)	Less than 8 000 bytes (works on 001 option of 9825A computer)
12. PELLTOM	"	"	"	Generalized production models(Pella & Tomlinson)	"	"
13. COHAN-2	"	"	"	Cohort analysis	80 characters thermal printer	Option 002 of 9825A allows computation of 25x50 data matrix

H. Farruggio, I.S.T.P.M. (cont'd)

Programme name (or title of publication)	Computer language	Availability of programme documentation	Name and address of programmer/ originating institution	Brief description of programme theory and purpose	Special hardware needed (e.g., tape drive, plotter)	Storage space: # bits, # programme, statements, etc., + other relevant factors
14. EXPLOIT-1	HPL	French with example	H. Farruggio & A. Laurec	Auto regenerating model of fishery exploitation, using Ricker's equations		Less than 8 000 bytes (option 001 of 9825A)
15. BEVHOLT	"	"	"	Beverton and Holt Analytic model	Plotter	

FRANCE

LIST OF COMPUTER PROGRAMMES ON STOCK ASSESSMENT AVAILABLE FROM:

Centre océanologique de Bretagne, CNEXO
B.P. 337 29273 Brest Cédex

Programme name (or title of publication)	Computer language	Availability of programme documentation	Name and address of programmer/ originating institution	Brief description of programme theory and purpose	Special hardware needed (e.g., tape drive, plotter)	Storage space: # bits, # programme, statements, etc.,+ other relevant factors
1. NORMSEP	HPL and BASIC	1(E) Tape 4	Tomlinson NMFS Adapted to HPL and BASIC by Conan	Hasselblad's maximum likelihood method for analysis of a mixture of normally distributed component groups in a size frequency distribution	Plotter optional	6 000 bytes
2. PRODFIT (Fox)	"	"	Fox NMFS Adapted by Conan	Surplus production model		3 programmes calling each other: larger one is 5 000 bytes long
3. GENPROD	"	"	Pella and Tomlinson Adapted by Conan	Other type of surplus production model		3 000 bytes
4. BGC3	"	"	Tomlinson Adapted by Conan	Fitting a Von Bertalanffy growth curve by least squares for unequally spaced observations	Plotter optional	6 000 bytes
5. Linear regressions Predictive and functional. Automatic or manual scaling of graph	HPL	1(E) Tape cartridge 4 Interactive programme	Conan CNEXO	Log transformation optional	Plotter optional	6 500 bytes with plotting routine
6. Kolmogorov-Smirnov test	"	"	"	Comparison of size frequency distributions		1 500 bytes
7. RxC Contingency table	"	"	"	Comparison of proportions		1 000 bytes

Centre océanologique de Bretagne CNEXO (cont'd)

Programme name (or title of publication)	Computer language	Availability of programme documentation	Name and address of programmer/ originating institution	Brief description of programme theory and purpose	Special hardware needed (e.g., tape drive, plotter)	Storage space: # bits, # programme, statements, etc., + other relevant factors
8. Comparison of predictive linear regressions by Anova	HPL	1(E) Tape cartridge 4 Interactive programme	Conan CNEXO			7 000 bytes
9. Fitting of a negative binomial by maximum likelihood	"	"	"	Useful for setting confidence limits on a patchy distribution	Plotter optional	7 500 bytes
10. BGC4	HPL and BASIC	1(E) Tape cartridge 4	Tomlinson NMFS Adapted by Conan	Fits by least squares K and L_∞ parameters of Von Bertalanffy growth curve to observations of initial and final sizes for unequal time intervals		2 000 bytes
11. Comparison of predictive linear regressions by plotting ellipses of joint confidence limits for slope and elevation	"	"	Conan	Useful for comparing regression lines when Anova method not applicable if residual variances differ	9872A plotter or graphics mode	6 000 bytes
12. Non-parametric	Anova's HPL	"	"	Kruskall Wallis Mann Whitney Friedman		5 000 bytes
13. GENPROD	FORTRAN	1(E) 2(E) 3(F) 4(F)	Jérome J. Pella et Patrick K. Tomlinson in Abramson (1971)[1/]	Modèle global de production généralisé		4 435 bytes

Centre océanologique de Bretagne CNEXO (cont'd)

Programme name (or title of publication)	Computer language	Availability of programme documentation	Name and address of programmer/ originating institution	Brief description of programme theory and purpose	Special hardware needed (e.g., tape drive, plotter)	Storage space: # bits, # programme, statements, etc., + other relevant factors
14. PRODFIT	FORTRAN	1(E) 2(E) 3(F) 4(F)	William W. Fox Southwest Fisheries Center NMFS/USA	Modèle global de production		3 897 bytes
15. NORMSEP	"	1(E) 2(E) 3(F) 4(F)	Patrick K. Tomlinson in Abramson (1971)[1/]	Analyse des distributions de taille		21 990 bytes
16. CROCO	"	1(E) 2(E) 3(F) 4(F)	William W. Fox Southwest Fisheries Center NMFS/USA	Analyse de cohortes à partir des captures en nombre par âge		6 000 bytes
17. FRG 705	"	1(F) 2(E) 3(F) 4(F)	Lawrence E. Gales Fisheries Research Institute University of Washington in Abramson (1971)[1/]	Estimation du taux de survie à partir de la structure d'âge d'un échantillon		3 634 bytes
18. AGECOM	"	1(E) 2(E) 3(F) 4(F)	D.J. Mackett California Dept. of Fish and Game in Abramson (1971)[1/]	Evolution de la structure d'âge utilisant le double échantillonnage en stratifiant par les structures de taille		15 074 bytes
19. YIEL 1	"	oui (F)	A. Laurec CNEXO/COB Brest sur la base de Yield par Gales in Abramson (1971)[1/]	Modèle de Ricker + vecteur prix + séparation de fraction de stock + impression cpue		9 511 bytes
20. YIEL 2	"	oui (F)	"	Modèle de Ricker + complément de YIEL 1 avec décalage des saisons de pêche		9 041 bytes
21. YIEL 3	"	oui (F)	"	Modèle de Ricker Adaptation de YIEL 2 pour intégrer une mortalité induite par la pêche mais s'ajoutant aux rejets		10 218 bytes

Centre océanologique de Bretagne CNEXO (cont'd)

Programme name (or title of publication)	Computer language	Availability of programme documentation	Name and address of programmer/ originating institution	Brief description of programme theory and purpose	Special hardware needed (e.g., tape drive, plotter)	Storage space: # bits, # programme, statements, etc., + other relevant factors
22. OEUF	FORTRAN	oui (F)	A. Laurec CNEXO/COB Brest sur la base de Yield par Gales in Abramson (1971)[1]	Calcul des fécondités par recrue dans le modèle de Ricker en variant mF et (tc)		8 131 bytes
23. MULEN	"	oui (F)	"	Modification de YIEL 1 pour placer en abcisse le multiplicateur d'un engin, en ordonnée l'autre		8 719 bytes
24. MUFEC	"	oui (F)	"	Adaptation de OEUF pour traiter une pêcherie à deux engins comme MULEN		8 379 bytes
25. FPOW	"	1 oui (F) 2 oui (F) 3 oui (F) 4 oui (F)	Adapté de FPOW in Abramson (1971)[1]	Puissance de pêches individuelles à partir de la méthode de Robson (1966)[2]		24 357 bytes
26. BGC2	"		Adapté de in Abramson (1971)[1]	Modélisation croissance Von Bertalanffy		14 014 bytes
27. BGC3	"	1	Patrick K. Tomlinson in Abramson (1971)[1]	Ajustement de la courbe de croissance selon Von Bertalanffy pour des intervalles de temps entre les groupes d'âge inégaux		3 578 bytes
28. BGC4	"	1(F) 2(E) 3(F) 4(F)	Patrick K. Tomlinson in Abramson (1971)[1]	Estimation des paramètres K et L de la courbe de croissance selon Von Bertalanffy. Sont connues les longueurs de chaque poisson à deux moments donnés		3 566 bytes
29. HPMZA	"	1 oui (F) 2 oui (F) 3 oui (F) 4 oui (F)	Le Gall et Raguenez GSG/COB Brest	Prévision de captures avec ou sans contrainte de quota; vecteur Fi, Mi, Wi, autorégénérant ou R introduit		2 120 bytes
30. VPA	"	1 oui (F) 2 oui (F) 3 oui (F) 4 oui (F)	"	VPA (conforme CIEM) sur 20 groupes d'âge 30 années, F moyen, pondéré sur âges et gamme d'année; vecteur démographique de l'année suivante		5 905 bytes

Centre océanologique de Bretagne CNEXO (cont'd)

Programme name (or title of publication)	Computer language	Availability of programme documentation	Name and address of programmer/ originating institution	Brief description of programme theory and purpose	Special hardware needed (e.g., tape drive, plotter)	Storage space: # bits, # programme, statements, etc., + other relevant factors
31. STOCRECR	FORTRAN	oui (F) et (E)	Adapté de Abramson(1971)1/ (Ricker 1)	Ajustement d'une relation stock-recrutement (Ricker, Beverton) ou Shepherd		
32. WTLN	"	"	Adapté de Abramson(1971)1/	Ajustement d'une relation taille/poids		
33. Z. JONES	"	oui (F)	Adapté de Verdelhan(ISTPM La Rochelle) Raguenez (GSG)	Analyse de cohortes sur composition en taille des captures (Jones)		
34. Z. GLOBAL	"	"	Adapté de B.W. Jones (Lowestoft)	Estimation de Z globale pondérée par la méthode de Brander (1974)		
35. AUTOVPA	"	"	"	VPA automatique selon la méthode de Pope et Shepherd (1981)		
36. PLURVPA	"	"	Adapté de Sparre (1980)	Adaptation de la VPA multispécifique, Pope et prévision de captures plurispécifiques et pluriflottilles		
37. FCPUVPA	"	"	"	Calcul de F final à partir de la régression prédictive: effectif des groupes (issus de VPA) cpue par groupe d'âge (CIEM, WG effort) programmé par Sparre		

1/ Abramson, N.J., 1971. Computer programmes for fish stock assessment. FAO Fish.Tech.Pap., 101:1-154

KENYA

LIST OF COMPUTER PROGRAMMES ON STOCK ASSESSMENT AVAILABLE FROM:

ECOSYSTEMS, Ltd.
Box 30239, Nairobi

Programme name (or title of publication)	Computer language	Availability of programme documentation	Name and address of programmer/ originating institution	Brief description of programme theory and purpose	Special hardware needed (e.g., tape drive, plotter)	Storage space: # bits, # programme, statements, etc., + other relevant factors
1. A computer simulation of the population dynamics of the Cape hakes. M.Sc. Thesis, Univ. Cape Town. (Also in press)	FORTRAN	1(E) 2 Thesis 3 Listing only	R.G. Mertens	Simulation allows effects of different mesh sizes, etc., on catch and population estimates to be tested	Disc - printer	

KUWAIT

LIST OF COMPUTER PROGRAMMES ON STOCK ASSESSMENT AVAILABLE FROM:

Kuwait Institute for Scientific Research (KISR)
P.O. Box 24885, Safat

Programme name (or title of publication)	Computer language	Availability of programme documentation	Name and address of programmer/ originating institution	Brief description of programme theory and purpose	Special hardware needed (e.g., tape drive, plotter)	Storage space: # bits, # programme, statements, etc., + other relevant factors
1. TRANL	Enhanced BASIC	2(E) 1/	G.R. Morgan (KISR)	Transposes Data Matrix and creates file on tape	HP 9845B desk top computer and HP 9872A plotter + graphics + I/O ROMS	Transposed file can contain maximum 1 000 data values
2. COMB	"	"	"	Combines separate data files	"	
3. Multivariate data analysis package 1/	"	" 1/, 2/	G.R. Morgan (KISR) + N.G. Hall (Western Australia Marine Research Laboratories)	Includes routines for: - cluster analysis - multivariate ANOVA - discriminant analysis - data classification	"	Interlinked series of 7 programmes run in sequence
4. Mapping and graphing routines		1/	"	Includes routines for: - mapping cruise data on charts of Kuwait waters (different scales) - drawing contour lines on cruise chart + 3-D representation of surface + effects of rotation/tilt - plots histograms + calculates elementary statistics		Especially adapted to Kuwait waters, but can be modified
5. KBLEE	"	2(E)	G.R. Morgan (KISR)	Calculates values of oceanographic variables (O_2, conductivity, etc.) from cruise data	HP 9845B desk top computer and HP 9872A plotter + graphics + I/O ROMS	Stores up to 50 observations for each parameter at each station
6. SHRIMP 3/, 4/	"	"	"	A suite of 5 programmes for summarizing shrimp fishery data and printing summaries of biological, and size and catch effort data	"	Data stored on tape by SHRIMP accessed by 4 other programmes

Programme name (or title of publication)	Computer language	Availability of programme documentation	Name and address of programmer/ originating institution	Brief description of programme theory and purpose	Special hardware needed (e.g., tape drive, plotter)	Storage space: # bits, # programme, statements, etc., + other relevant factors
7. VB	Enhanced BASIC	2(E)	G.R. Morgan	Uses either weight or length to calculate Von Bertalanffy parameters	Can plot with confidence intervals on 9872 plotter	Up to 1 000 points accommodated
8. Population dynamic package	Extended BASIC	2(E)[5]	N.G. Hall	Suite of 8 programmes to: 1. Analyse catch curves 2. Length frequency cohort analysis 3. Growth curve fitting 4. Mortality from tagging 5. Production model fits 6. Y/R (Ricker) 7. Selection curves from trawl data 8. Ricker stock-recruitment curves	HP 9845B desk top computer and HP 9872A plotter + graphics + I/O ROMS	
9. BH	Extended BASIC	2(E)	G.R. Morgan	Yield/recruit Beverton and Holt	HP 9845B desk top computer and HP 9872A plotter + graphics + I/O ROMS	
10. COHORT	"	"	"	Size frequency cohort analysis[6]		
11. SLEC	"	"	"	Fits logistic selection curve by maximum likelihood method (codend cover experiments)	Plots selection curve on HP 9872 plotter	Maximum of 50 length classes
12. STOCK	"	"	"	Calculates and plots the Ricker spawner/recruit curve	Plots curve on HP 9872 plotter	Maximum of 50 data pairs
13. JOLLY				Pop. size, survival rate, immigrants + emigrants from multiple marketing experiments, and compares with fishing effort data[7]	Plots curve on HP 9872 plotter	Maximum of 40 sampling occasions possible
14. ZIP	Extended BASIC	2(E)	G.R. Morgan	Estimates Z from size frequency data + Von Bertalanffy parameters[8]		

Kuwait Institute for Scientific Research (KISR)(cont'd)

Programme name (or title of publication)	Computer language	Availability of programme documentation	Name and address of programmer/ originating institution	Brief description of programme theory and purpose	Special hardware needed (e.g., tape driver, plotter)	Storage space: # bits, # programme, statements, etc., + other relevant factors
15. EXPEND	Extended BASIC	2(E)	G.R. Morgan	Summarizes manpower and expenditures on a monthly basis		

1/ Morgan, G.R., 1981. Computer programmes available at Mariculture and Fisheries Department for use on mini-computers. Technical Report, Kuwait Institute for Scientific Research, 192 pp.

2/ From: Cooley, W.W. and P.R. Lohnes, 1976. Multivariate Data Analysis (John Wiley and Sons), 357 pp. (Generalized plotting routines and tape storage of plotted data.)

3/ See: Morgan, G.R., 1981. A programme package for shrimp data storage and summarization. Technical report of Kuwait Institute for Scientific Research

4/ Morgan, G.R., Methodology of estimating catch and fishing effort: Kuwait's finfish fisheries. Technical Report, Kuwait Institute for Scientific Research

5/ Hall, N.G., 1981. Fish population dynamic routine for use in fisheries analysis. Technical Report, Kuwait Institute for Scientific Research

6/ Jones, R., 1974. Assessing the long-term effects of charges in fishing effort as mesh size from length composition data (ICES Demersal Fish - Northern Committee. DOC. M 1974/F33)

7/ Jolly, G.M., 1965. Explicit estimates from capture-recapture data - Stockastic model. Biometrika 52, 225-97

8/ Morgan, G.R., 1961. Population dynamic of spiny lobsters *In* Cobb, J.S. and B.F. Phillipe (Eds). The biology and management of lobsters (Academic Press, 1981, p. 202-3)

NEW ZEALAND

LIST OF COMPUTER PROGRAMMES ON STOCK ASSESSMENT AVAILABLE FROM:

Fisheries Research Division
Ministry of Agriculture and Fisheries
P.O. Box 19062, Wellington

Programme name (or title of publication)	Computer language	Availability of programme documentation	Name and address of programmer/ originating institution	Brief description of programme theory and purpose	Special hardware needed (e.g., tape drive, plotter)	Storage space: # bits, # programme, statements, etc., + other relevant factors
1. 2TBELL.BAS	BASIC*	1(E),2 1/	I.F. West	Yield Estimates Thompson and Bell	none	3326 words static 4058 words dynamic
2. 2LESCE.BAS	"	" 2/	R.K. Allen	Leslies catch/effort analysis	"	1687 words static 1897 words dynamic
3. 2JOLLY.BAS	"	" 3/		Jolly-Seber capture/ recapture analyses	"	2337 words static 3265 words dynamic
4. 2SCHUM.BAS	"	" 1/, 2/	I.F. West	Schumacher estimates of population size from multiple censur experiments	"	1644 words static 1944 words dynamic
5. 2SCHNA.	" **	" 2/		Schnabel estimates of population size for multiple capture/re-capture experiments	"	2872 words static 3088 words dynamic
6. 2VBGC2	"	1(E)	R.K. Allen	Von Bertalanffy growth-in length curve for equally spaced sample sizes for separate ages	"	

* BASIC RT11/V02B ** MUBAS

1/ Ricker, W.E., 1975. Computation and Interpretation of Biological Statistics of Fish Populations (Bulletin of Fisheries Research Board of Canada. Bulletin 191, 1975)

2/ Seber, C.A.F., 1973. Estimates of Animal Abundance and related parameters. (C. Griffin & Co., 1973)

3/ Jolly, G.M., 1965. Explicit estimates from capture-recapture data with both death and immigration - stochastic models. Biometrika, 52:225-47

THE PHILIPPINES

LIST OF COMPUTER PROGRAMMES IN STOCK ASSESSMENT AVAILABLE FROM:

International Center for Living Aquatic Resources Management (ICLARM)
MCC P.O. Box 1501, Makati, Metro Manila

Programme name (or title of publication)	Computer language	Availability of programme documentation	Name and address of programmer/ originating institution	Brief description of programme theory and purpose	Special hardware needed (e.g., tape drive, plotter)	Storage space: # bits, # programme, statements, etc.,+ other relevant factors
1. ELEFAN I	Radio Shack BASIC II[1/]	2(E)[2/]	D. Pauly (ICLARM)	Extract by an objective method a set of length growth parameters from a length-frequency data set (seasonal growth optional)	TSR 80 Model 1 micro-computer 16K or more	262 programme lines
2. ELEFAN II	"	2(E)	"	Given growth parameters and length-frequency data, programme estimates Z from a catch curve, and a 'recruitment pattern' reflecting the seasonality of recruitment	"	229 programme lines
3. ETAL 1	"	2(E)[3/]	"	Fits seasonally oscillating length growth data, or weight data to Von Bertalanffy growth function	TSR 80 Model 1 micro-computer	165 programme lines
4. A simple method of fitting seasonally oscillating length growth data	HP	2(E)[4/]	D. Pauly and G. Gaschütz (ICLARM)	Fits Von Bertalanffy equation with incorporated sine function to seasonal length growth data	HP 67/97	2X 224 steps
5. VPA with catch-at-length data	"	HP Leaflet	D. Pauly and J. Pope (ICLARM)	Modification of Gulland's VPA for use with lengths	"	126 steps
6. Jones length cohort analysis	"	"	D. Pauly (ICLARM)	Modification of Pope's cohort analysis for use with lengths	"	92 steps

1/ See: Lien, D.A., 1978. "THE BASIC Handbook". Compusoft Publishing, San Diego, USA, 360 p. (For conversion of this programme to other BASIC standard notations)

2/ Pauly, D. and N. David, 1981. A basic programme for the objective extraction of growth parameters from lengths frequency data. ICES Meeting Document CM 1980/D:7 Statistics Committee, 14 p. (mimeo)

3/ Gaschütz, G., D. Pauly, N. David, 1980. A versatile basic programme for fitting weight and seasonally oscillating length growth data. ICES Meeting Document CM 1980/D:6 Statistics Committee, 23 p.

4/ Pauly, D. and G. Gaschütz, 1979. A simple method for fitting oscillating length growth data, with a programme for pocked calculators. ICES Meeting Document CM 1979/G:24 Demersal Fish Committee, 25 p.

SOUTH AFRICA

LIST OF COMPUTER PROGRAMMES ON STOCK ASSESSMENT AVAILABLE FROM:

G. Stavrides
Department of Sea Fisheries
Foretrust Building, Foreshore, Cape Town

Programme name (or title of publication)	Computer language	Availability of programme documentation	Name and address of programmer/ originating institution	Brief description of programme theory and purpose	Special hardware needed (e.g., tape drive, plotter)	Storage space: # bits, # programme, statements, etc., + other relevant factors
1. "Allen's method"	HP 97	2(E)	R.G. Mertens	Allen's method for change in yield with size at first capture		
2. Von Bertalanffy	"	"	"	Fits Von Bertalanffy curve to length at age data (K, L_∞, t_o) and predicts size at age		

SPAIN

LIST OF COMPUTER PROGRAMMES ON STOCK ASSESSMENT AVAILABLE FROM:

Instituto Español de Oceanografía
Alcalá 27-40, Madrid 14

Programme name (or title of publication)	Computer language	Availability of programme documentation	Name and address of programmer/ originating institution	Brief description of programme theory and purpose	Special hardware needed (e.g., tape drive, plotter)	Storage space: # bits, # programme, statements, etc., + other relevant factors
Stock assessment package includes:	BASIC	1(S) 2(S) listing	J.A. Pereiro and P. Pallarés		HP 3 000 (other hardware)	
1. VPA	"	"		VPA, solves for F by Bolzano method		
2. VPI	"	"		Cohort analysis (Pope's method)		
3. Ricker	"	"		Ricker yield/recruit		
4. VP	"	"	J.A. Pereiro and P. Pallarés	Cohort analysis: variable M at age		
5. ?	"	"		Beverton and Holt yield/ recruit		
6. ?	"	"		Fitting Von Bertalanffy equation		
7. ?	"	"		Multiple regression		
8. List of programmes & routines directly concerned with fish stock assessment. Includes following programmes:	BASIC or HP?	Yes 2(S)	A. Fernandez Garcia	1. General routines for entering/editing data 2. Compiling/plotting weighted/unweighted length frequencies 3. Selectivity analysis 4. Growth (Von Bertalanffy) - transformation of length to age with an age-length key	Hewlett-Packard 9815A with 9862 A X-Y plotter	

Note: No. 8 = Instituto Español de Oceanografía, Laboratorio de la Coruña, La Coruña, España

UK

LIST OF COMPUTER PROGRAMMES ON STOCK ASSESSMENT AVAILABLE FROM:

Department of Agriculture and Fisheries for Scotland
Marine Laboratory
P.O. Box 101, Victoria Road, Aberdeen AB9 8DB, Scotland

Programme name (or title of publication)	Computer language	Availability of programme documentation	Name and address of programmer/ originating institution	Brief description of programme theory and purpose	Special hardware needed (e.g., tape drive, plotter)	Storage space: # bits, # programme, statements, etc., + other relevant factors
1. VPA	BASIC +	2(E)	D.W. Armstrong	Controls VPA 1,2,3	none	Limited only by disc size
2. VPA 1	"	"	"	Inputs and checks data for VPA	"	"
3. VPA 2	"	"	"	VPA data including Biomass	"	"
4. VPA 3	"	"	"	Short-term predictions from results of VPA 2 or independently	"	"
5. VPA 4	"	"	"	Prints results of VPA 3	"	"

USA

LIST OF COMPUTER PROGRAMMES ON STOCK ASSESSMENT AVAILABLE FROM:

National Marine Fisheries Service
Northeast Fisheries Center, Woods Hole, MA 02543

Programme name (or title of publication)	Computer language	Availability of programme documentation	Name and address of programmer/ originating institution	Brief description of programme theory and purpose	Special hardware needed (e.g., tape drive, plotter)	Storage space: # bits, # programme, statements, etc., + other relevant factors
1. LSTB	FORTRAN	1(E),2,3	K. Paine, NEFC, Woods Hole, MA	Calculates statified means and biomass estimates by species for individual strata or strata sets	none	26 K words 900 statements
2. LSTS	"	"	"	Lists weight and number by species and cruise	"	25 K words 300 statements
3. FISHMAP	"	1(E),2,3,4	O. Jackson, NEFC, Woods Hole, MA	Plots outline base map data and values associated with specific latitude-longitude points	Plotter	20 K words 2 000 statements
4. SUR1-LSTW	"	1(E),2,3	K. Paine, NEFC, Woods Hole, MA	Provides species distributions of mean catch per tow and stratified mean catch per tow values by cruise	none	20 K words 446 statements
5. SUR1-W210	"	"	"	Calculates means, stratified means and variances by species	"	15 K words 495 statements
6. SUR1-L215	"	"	"	Calculates means, stratified means and variances by species and length interval	"	25 K words 412 statements
7. STRS76	"	"	"	Calculates sample means and variances by species for catch per tow data for individual strata	"	30 K words 396 statements
8. CHOP	"	"	"	Reduces catch per tow values by number and weight below a selected length	"	4 K words 246 statements
9. SUR1-LSTL	"	"	"	Provides distribution of mean catch per tow and stratified mean catch per tow at length, mean lengths and variances, and optional distributions over age	"	34 K words 1 387 statements

National Marine Fisheries Service (cont'd)

Programme name (or title of publication)	Computer language	Availability of programme documentation	Name and address of programmer/ originating institution	Brief description of programme theory and purpose	Special hardware needed (e.g., tape drive, plotter)	Storage space: # bits, # programmes, statements, etc., + other relevant factors
10. FMBIOSEX FMBIOMKT	FORTRAN	1(E),2,3	O. Jackson, NEFC, Woods Hole, MA	Numbers landed by length and age from length - frequency and age composition samples, landings data and length weight parameters	none	20 K words 912 statements
11. STST75 STSTPOP	"	"	K. Paine, NEFC, Woods Hole, MA	Calculates stratified means and variances for research vessel survey catch per tow data by sampling strata set	"	STST75 25 K words 353 statements STSTPOP 22 K words 426 statements
12. MGEAR	"	2, 3	W.H. Lenarz SWFC, La Jolla, California	Calculate equilibrium yield per recruit for several gears (Ricker's method)	"	5 K words 130 statements
13. FR731	"	2	C.L. Berude, California Dept. of Fisheries and Game	Relative fishing power by analysis of variance (Robson's method)	"	30 K words 821 statements
14. ESP3	"	1(E),2,3	K. Paine, NEFC, Woods Hole, MA	"	"	26 K words 1 472 statements
15. YPER	"	2, 3	W.H. Lenarz, SWFC, La Jolla, California	Calculates equilibrium yield per recruit; generates relative isopleths for different E and C values as a function of M and K	"	6 K words 94 statements
16. FRG705	"	"	L.E. Gales University of Washington	Computes mortality and survival rates from vectors of catch at age data	"	5 K words 232 statements
17. FMBVPA	"	1(E),2,3,4	O. Jackson, NEFC, Woods Hole, MA	Virtual population analysis; data input in matrix form or by cohort	"	10 K words 200 statements

National Marine Fisheries Service (cont'd)

Programme name (or title of publication)	Computer language	Availability of programme documentation	Name and address of programmer/ originating institution	Brief description of programme theory and purpose	Special hardware needed (e.g., tape drive, plotter)	Storage space: # bits, # programmes, statements, etc., + other relevant factors
18. FMBYPCT	FORTRAN	1(E),2,3	M. Parrack, NEFC, Woods Hole, MA	Calculates equilibrium yield per recruit (Beverton-Holt method)	none	2 K words 40 statements
19. FRG701	"	2, 3	L.E. Gales University of Washington	Calculates equilibrium yield per recruit using the incomplete Beta function	"	16 K words 254 statements
20. FRG708	"	"	"	Calculates equilibrium yield per recruit (Ricker's method)	"	10 K words 393 statements
21. BGC2	"	"	N.J. Abramson California Dept. of Fisheries and Game	Fits the Von Bertalanffy growth curve to data for equally spaced age groups	"	21 K words 279 statements
22. BGC3	"	"	P.K. Tomlinson California Dept of Fisheries and Game	Fits the Von Bertalanffy growth curve to data for unequally spaced age groups	"	6 K words 100 statements
23. GENPROD	"	"	J.J. Pella P.K. Tomlinson, IATTC, California, Dept. of Fisheries and Game	Fits the generalized stock-production model to catch and effort data	"	6 K words 176 statements
24. PRODFIT	"	"	W.W. Fox, Jr., SWFC, La Jolla, California	"	"	6 K words 566 statements
25. FMBPRED	"	"	R.K. Mayo, NEFC, Woods Hole, MA	Predicts stock size and catch by age group and year given initial stock sizes and weight at age	"	6 K words 277 statements
26. GRAPH	"	1(E),2,3	W. Kramer, NEFC, Woods Hole, MA	Displays data for two or three dimensional histograms	Plotter	15 K words 1 500 statements
27. PICTURE	"	2, 3	M. Drueitt, Los Alamos Scientific Laboratory, Los Alamos, New Mexico	Three-dimensional plotting routine	"	10 K words 928 statements

USA

LIST OF COMPUTER PROGRAMMES ON STOCK ASSESSMENT AVAILABLE FROM:

c/o Helen Salo
Fisheries Analysis Center, College of Fisheries, University of Washington
Seattle, Washington 98195[1/]

Programme name (or title of publication)	Computer language	Availability of programme documentation	Name and address of programmer/ originating institution	Brief description of programme theory and purpose	Special hardware needed (e.g., tape drive, plotter)	Storage space: # bits, # programmes, statements, etc., + other relevant factors
1. FR T3160	FORTRAN IV	1(E)	?	Survivorships under varied recruitment, F,M	CDC computer	
2. FR G3180	"	"	?	Spawner-recuit relationships with varied recruitment	"	
3. FR 320 and FR M3240	"	"	?	2-D contour plots of fish density from sonar readings	CDC computer Data read from magnetic tape created by FRL 320 - plotted on CALCOMP plotter	
4. FR K3250	"	"	?	Statistical summary of stomach content data	CDC computer	
5. FR K3290	FORTRAN IV?	"	?	Species diversity index from samples of different species	"	
6. FR 67010	FORTRAN II	"	?	Incomplete Beta function in Beverton and Holt equation	"	
7. FR 67050	FORTRAN IV	"	?	Analysis of catch curves and mortality rates[2/]	"	
8. FR A7060	"	"	?	Fitting Von Bertalanffy's growth equation(length) for equal/unequal time intervals	"	
9. FR G7080	"	1(E), 2?	?	Piece-wise integration Ricker Y/R and isopleths		
10. FR 87230	"			Mortality rates and population estimate from tagging (Jolly-Sieber)[3/]		

1/ A selection of more generally useful programmes from the more extensive list in the Fisheries Analysis Center

2/ After methods of Robson, D.S. and D.G. Chapman, 1961. Catch curves and mortality rates. Trans.Am.Fish.Soc., 90:181-9

3/ Jolly, G.M., 1965. Explicit estimates from capture-recapture data with both death and immigration-stockastic model. Biometrika, 52:225-47

USSR

LIST OF COMPUTER PROGRAMMES ON STOCK ASSESSMENT AVAILABLE FROM:

VNIRO
V. Krasnoselskaya 17, Moscow 107140

Programme name (or title of publication)	Computer language	Availability of programme documentation	Name and address of programmer/ originating institution	Brief description of programme theory and purpose	Special hardware needed (e.g., tape drive, plotter)	Storage space: # bits, # programmes, statements, etc., + other relevant factors
Complex Programmes						
1. Stock assessment and possible catch (Schaefer's, Fox's, Doi's, Beverton-Holt's methods, regression estimate)	FORTRAN	2, listing	VNIRO	Comparison of the maximum equilibrium catch and other characteristics obtained by different methods, such as methods of Schaefer, Fox, regression estimate, as well as determination of the the rate of natural mortality and recruitment on the basis of analysis of fishing statistics by Doi's method. If initial parameters are available, the yield per recruit as a function of the instantaneous rate of fishing mortality is estimated by the Beverton and Holt method	Printer	100 K words
2. Assessment of yield/recruitment, calculation of isopleth diagram and the eumetric fishing curve	"	"	ATLANTNIRO	1. Estimation of possible yield per unit as a function of fishing intensity by the Beverton and Holt method 2. Estimation of yield per recruit in a transition period and calculation of the number of years with decrease (increase) of profit as a result of a new fishery regulation 3. Estimation of the yield per recruit as a function of fishing mortality and age of exploitation at a given fishing mortality 4. Estimation of yield per recruit by Kutti's method	"	"

VNIRO (cont'd)

Programme name (or title of publication)	Computer language	Availability of programme documentation	Name and address of programmer/ originating institution	Brief description of programme theory and purpose	Special hardware needed (e.g., tape drive, plotter)	Storage space: # bits, # programmes, statements, etc., + other relevant factors
Separate Programmes						
3. VPA	FORTRAN	2, listing	ATLANTNIRO	Estimation of stock and fishing mortality rate by age groups and years of fishery	Printer	100 K words
4. Method of cohort analyses	"	"	"	Estimation of the fishing mortality rate and year-class abundance	"	"
5. Von Bertalanffy equation: estimation of parameters of the Von Bertalanffy equation (growth in length); equation (growth in weight)	"	"	"	Estimation of parameters of the Von Bertalanffy equation	"	"
Methods of Direct Calculation						
6. Calculation of abundance estimate using data from trawling surveys	"	"	"	Estimation of the abundance value (catch per unit trawl effort)	"	"
Data Treatment Methods						
7. A programme for calculating statistical characteristics of one or two samples	"	"	VNIRO	Calculation of the main statistical characteristics of a sample as well as errors, mutual and auto-correlation functions for each sample	"	"

VNIRO (cont'd)

Programme name (or title of publication)	Computer language	Availability of programme documentation	Name and address of programmer/ originating institution	Brief description of programme theory and purpose	Special hardware needed (e.g., tape drive, plotter)	Storage space: # bits, # programmes, statements, etc., + other relevant factors
8. Regression analyses of two factors	FORTRAN	2, listing	VNIRO	Least-square method of approximation to data by linear and power functions of one argument and calculation of statistical characteristics	Printer	100 K words
9. Polynomial and exponential approximation of a function of one argument	"	"	"	Least-square method of approximation to data by the exponential functions and a polynomial of one argument	"	"
10. Drawing a map of a two-dimensional field	"	"	ATLANTNIRO	Least-square approximation of any given discrete field by a polynomial of two arguments and its isoline map listing	"	"